REMARKS

Further reconsideration of this application is respectfully requested.

Initially, there are a couple of anomalies in the Examiner's Advisory Action that need to be clarified. First of all, the Advisory Action does not mention claim 1. However, it is assumed that the Examiner intended to include claim 1 in the continuing grounds of rejection. yes

Secondly, the Examiner's Advisory Action repeatedly identifies the primary one of the applied references as EP '351. However, the undersigned (new) attorney for the applicants can find no full identification of any such reference in the file for this application. Instead, the undersigned assumes that the Examiner intended to repeat the rejection made in the earlier final Office Action where the primary reference relied upon was EP '591. If this is incorrect, then the Examiner is respectfully requested to fully identify the newly cited EP '351 reference so that it may be considered. yes again thank you.

Based on the assumptions just stated above, what is believed to be the outstanding rejection of all pending claims as allegedly being made "obvious" under 35 U.S.C. §103 by the three-way combination of EP '591 in view of EP '423 and any one of Taylor '808, Bryan '456 or Kida '624 is respectfully traversed.

The Examiner is thanked for including an explanation in response to the applicant's earlier arguments in the Advisory Action of 12/18/2001. It is assumed that the

Examiner's comments with respect to EP '351 are actually intended to be comments with respect to EP '591. In any event, based on the Examiner's comments, an attempt has been made to reformulate applicant's pending claims by cancelling all earlier pending claims without prejudice or disclaimer in favor of the new claims submitted above. Arguments below will therefore be directed to the new claims.

EP '591 merely discloses a typical NO_x sensor. EP '423 merely discloses an analog controller installed in a connector which works to control an oxygen sensor. Both fail to teach or suggest features of the applicant's invention as recited in the above new claims.

For example, EP '591 does not disclose or suggest a heater control circuit which works to control the heater using the impedance of the sensor element in conjunction with a co-located microcomputer which is mounted in the connector and equipped with the gas concentration determining circuit to output a gas concentration signal to a remote digital signal processor through serial communication.

EP '423 disclose connector 105 mounted on IC substrate 104 including the λ-detector circuit and a heater circuit. However, this pertains uniquely to an air-fuel ratio sensor which does not even encounter the problem(s) underlying the present invention.

The problem to be solved by the applicant's invention is that gas concentration sensors (such as NO_x sensors) have an output considerably weaker in level (e.g., 5 to 10

μA) than that of an air-fuel ratio sensor as in EP '423. Thus in applicant's claimed environment, induced electrical noise is added undesirably to the output signal until it reaches an external device, which can then result in operational errors by the remote computer (e.g., an ECU).

EP '423 air-fuel ratio sensor is not a sensor designed to output a weak current signal as in the gas concentration sensor of the invention and thus does not encounter the above problem. The EP '423 structure therefore does not suggest use of a microcomputer in a gas concentration sensor connector that is connected to first and second sensor cell electrodes to output a gas concentration signal in the form of a voltage signal as a function of concentration of a target gas to an external device through serial communication for minimizing error in determining the concentration of the target gas.

Additionally, EP '423 and EP '591 both fail to teach or suggest circuitry equipped with a concentration sensor connected to first and second sensor cell electrodes to output a gas concentration signal in the form of a voltage signal as a function of concentration of a target gas to an external device through serial communication.

Accordingly, there is no "obvious" way to combine the teachings of EP '423 and EP '591 to arrive at the present invention.

The Examiner appears to recognize that the three tertiary references (Taylor, Bryan or Kida) are literally "non-analogous" art in most senses of the word but

① Kida certainly not non-analogous

② references are analogous

nevertheless relies upon Taylor and Bryan "solely for teaching concerning electronic circuitry and both indicate that the substitution of microcomputer control circuitry for analog circuitry is known and advantageous (see Bryan, column 3, lines 1-5; and Taylor, column 12, lines 54-59)."

While in some contexts, the substitution of digital for analog circuitry might be "obvious", it is respectfully submitted that neither of these references in any way teach or suggest the use of a programmed digital computer (i.e., microcomputer) in the sensor's own connector so as to avoid noise problems thereafter by digitally communicating with other control circuitry. The cited portion of Bryan (column 3, lines 1-5) merely introduces the digital circuitry actually utilized in Bryan's exemplary embodiment. However, the undersigned is at a loss to see where any of that digital circuitry is employed within a connector or any other structure that is physically closely adjacent the sensor device per se so as to eliminate or reduce electrical noise problems with weak analog sensor signals.

The applicant's sensors are utilized typically in systems where there is already a digital signal processor employed at some downstream location (e.g., an ECU). Applicant's invention is directed towards introduction of an additional digital signal processor substantially at the site of the sensor itself so as to more immediately respond to a weak sensor output and process it into robust digital form for transmission to other more remote digital processing circuitry in the overall system.

In this context, the Bryan '456 digital circuit teaching is really more analogous to the already existing main system computer typically utilized with applicant's sensor. Accordingly, there is no teaching or suggestion in Bryan of employing yet another programmed digital computer in a physical position close to the sensor and between the sensor per se and the overall control system computer. Actually, Bryan '456 teaches a microcomputer system that has a keyboard, display, printer, etc. (e.g., see Figure 5). It is not seen how such a system could possibly reside inside the sensor connector as required by applicant's new independent claim 16.

Similarly, Taylor at column 12, lines 54-59 is only relevant insofar as it stands for the proposition of that sometimes, in some contexts, it may be advantageous to switch from analog to digital implementations. However, the undersigned does not see any teaching or suggestion in Taylor that would lead one of only ordinary skill in the art to add a local additional programmed digital microcomputer to a sensor housing and/or connector. At best, both of these references have only vestigial relevance in suggesting that applicant's central control system (which uses the sensor output as an input) might be advantageously executed in digital form rather than analog. However, that totally begs the question as to whether or not there is any reason to locate programmed digital microcomputer circuit substantially at the situs of the sensor per se (i.e., rather than in the centralized control computer facility elsewhere in the system).

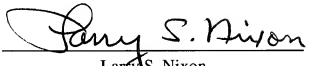
The Kida reference at column 7, lines 58 and 59 is no more relevant than Bryan and/or Taylor in this regard.

In short, none of the five references being relied upon by the Examiner even recognizes the problem addressed by the applicant's claimed invention. Namely, the applicant has realized that electrical noise problems associated with a particular kind of gas concentration sensor can be reduced if a digital signal processor is incorporated in the sensor's own connector (i.e., very close to the sensor itself so as to minimize the length of wire over which noise signals might be induced before digital signal processing is undertaken). Without at least a recognition of the problem, it cannot possibly have been "obvious" to selectively pick and choose components from various prior art references and reconnect them in manners taught only by this application and/or the Examiner's use of hindsight reasoning.

Accordingly, this entire application is now believed to be in allowable condition and a formal Notice to that effect is respectfully solicited.

Respectfully submitted,

NIXON & VANDERHYE P.C.

By: 

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